

NON-PUBLIC?: N
ACCESSION #: 9110290249
LICENSEE EVENT REPORT (LER)

FACILITY NAME: LaSalle County Station Unit 2 PAGE: 1 OF 4

DOCKET NUMBER: 05000374

TITLE: Unit 2 Reactor Scram Due to Turbine Valve Closure
EVENT DATE: 09/24/91 LER #: 91-012-00 REPORT DATE: 10/18/91

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: J. Tokarz, Technical Staff Engineer, TELEPHONE: (815) 357-6761
Extension 2875

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: TG COMPONENT: MANUFACTURER:
REPORTABLE NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

At 0015 hours, on September 24, 1991, with Unit 2 in Operational Condition One (Run) at 100% power (1112 MWe), the reactor scrambled on Neutron Monitoring (NR) IG! upscale trips as a result of a pressure/power transient induced by the Main Turbine Valves (EH) TG! closing. No testing or maintenance was being performed at the time of the event. All other equipment responded as designed. All Reactor Control Rods inserted, the Main Turbine Bypass Valves opened, the Motor Driven Reactor Feed Pump maintained reactor level and Safety Relief Valves (SRV's) S, U, K, and E (NB) SB! cycled and then reseated.

The root cause of the scram has not been determined. An analysis of the sequence of events by Commonwealth Edison and the General Electric Company indicates that a spurious signal in the Electro-Hydraulic Control (EHC) system either falsely signaled a Main Turbine overspeed condition

or created a sudden demand signal to be at zero load.

The speed circuits of EHC System were replaced and calibrated. This was also the corrective actions to a similar event which occurred at the James A. Fitzpatrick Plant, New York Power Authority, on November 5, 1989. Also, the circuits associated with the #1 3KHz oscillator were replaced and calibrated.

The speed circuits will be continuously monitored until the next refueling outage. The Mark I EHC system was supplied by General Electric.

This event is reportable pursuant to the requirements of 10CFR50.73(a)(2)(iv) due to an automatic actuation of the Reactor Protection System.

END OF ABSTRACT

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PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor

Energy Industry Identification System (EIIS) codes are identified in the text as XX!.

A. CONDITION PRIOR TO EVENT

Unit(s): 2 Event Date: 9/24/91 Event Time: 0015 Hours

Reactor Mode(s): 1 Mode(s) Name: Run Power Level(s): 100%

B. DESCRIPTION OF EVENT

At 0015 hours, on September 24, 1991, with Unit 2 in Operational Condition One (Run) at 100% power (1112 MWe), the reactor scrammed on Neutron Monitoring (NR) IG! upscale trips as a result of the pressure/power transient induced by the Main Turbine Valves (EHC) TG! closing. No testing or maintenance was being performed at the time of the event.

All other equipment responded as designed. All Reactor Control Rods inserted, the Main Turbine Bypass Valves opened, the Motor Driven Reactor Feed Pump maintained reactor level control and Safety Relief Valves (SRV's) S, U, K, and E (NB) (SB) cycled and then reseated.

Engineered Safety Feature (ESF) Division I SRV Lo-Lo set seal-in did not occur (Division II did come in). The requirements for a ESF Division I Lo-Lo Set were never met, so these actions were as expected. The turbine-automatically tripped on generator reverse power, as would be expected, following a reactor scram.

C. APPARENT CAUSE OF EVENT

The root cause of the scram has not been specifically determined. An analysis of the sequence of events by Commonwealth Edison and the General Electric Company in Schenectady, NY, indicates that a spurious signal in the EHC system either falsely signaled a Main Turbine overspeed trip or a sudden demand signal to be at zero load.

The sequence of events were obtained from the plant Sequential Events Recorder (Hathaway - resolution of 1 msec) and the Transient Events Recorder (Startrec - resolution of 20 msec) . The sequence of events (and milliseconds to Scram) is as follows:

Time ms Prior To Scram Alarm

00:15:53:692 1970 Intercept Valve (ICV) Fast Closure - (1)
:697 1965 EHC Electrical Malfunction - (2)
:771 1891 Bypass Valve Open - (3)
:805 1857 Turbine Stop Valve #2 Not Full Open - (4)
00:15:55:662 0 Reactor Auto Scram - (5)
00:15:56:073 + 411 Turbine Stop Valve #2 Full Open - (6)
00:16:14:674 +18601 Non-EHC Turbine Trip (Reverse Power) - (7)

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(1) Intercept Valve (ICV) Fast Closure Alarm - The ICV's are open at rated speed. The three master ICV's begin to close, under servo control, if speed reaches 105% and are full closed at 107%. If actual and required-valve position (of any of the three master ICV's) is off by more than 5% in the closing direction, all six ICV's will fast close. This feature is only in effect when power is greater than 20% of rated power. The ICV positioning unit's only input is speed. The valve position circuit of #1 ICV relies on the output of #1 3 KHz oscillator. Actual ICV position is not available to Startrec.

(2) EHC Electrical malfunction alarm - The ICV fast closure signal directly feeds this alarm. This alarm would also annunciate if the secondary speed circuit was in control or if any of the four oscillator outputs went high or low. The failed oscillator alarm would normally lock-in locally. No local oscillator alarms were noted. The oscillator signal is not available to Startrec.

(3) Bypass valve open alarm - The Main Turbine Bypass Valves are driven by pressure control. When the control valves started to close (due to demand), pressure increased above the setpoint and the Bypass valves opened.

Startrec showed that the Bypass and Control Valve demand signals along with the Load Reference Error Signal and the Stop Valve #2 position changed within 20 msec of each other. Because of this quick change, it is not possible to tell what occurred first.

The valve position circuit of #1 and #2 Bypass Valves and #1 Control Valve, and the Load Reference Amplifier also relies on the output of #1 3 KHz oscillator.

(4) TSV #2 Not Full Open-Alarm - This is an unusual alarm since TSV #2's input was grounded --it should have stayed full open. Since the other TSV's stayed open and the standby EHC pump was available and did not auto-start (1300 psig decreasing), it is not clear if a hydraulic transient caused this closure. During the April 19, 1991 transient involving the fast opening of all five bypass valves, TSV #2 Not Full Open did not alarm. But, during that transient, the ICV's did not fast close.

Startrec did indicate that the stop valve actually closed at the moment of the demand changes. It ramped close, for 687 msec and then ramped to full open. Startrec's input for this is from TSV #2's diode function generator. The valve position circuit of #2 Turbine Stop Valve also relies on the output of #1 3 KHz oscillator.

(5) Reactor Auto Scram Alarm - This signal originated by Neutron Monitor at 118% power (APRM Flux High).

(6) TSV #2 Full Open Alarm - Startrec showed it was open for 2.268 seconds.

(7) Non-EHC Turbine Trip (Reverse Power) - This turbine trip is

generated by the Main Generator protective relaying when the generator motorizes.

D. SAFETY ANALYSIS OF EVENT

The safety significance was minimal. No Technical Specifications were exceeded. There were no other abnormal alarms. No ECCS systems were required to operate and Safety Relief Valves (NB) SB! operated as necessary. The EHC system, including the bypass valves, is Non-Safety Related.

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E. CORRECTIVE ACTIONS

No abnormal conditions were found to indicate circuit drift or failure while performing the following LaSalle Instrument Procedures (LIP'S):

- LIP-EH-04 Voltage Comparators
- LIP-EH-20 Load Control Limits
- LIP-EH-22 HQ Speed And Acceleration References
- LIP-EH-23 F/V Converter
- LIP-EK-24 Low Value Gates

After completion of the troubleshooting and discussions with General Electric (which included review of corrective actions performed in response to a similar event at the James A. Fitzpatrick Plant; New York Power Authority on November 5, 1989) the following speed circuits were replaced:

- Primary Frequency To Voltage Converter
- Primary Speed And Acceleration Operational Amplifiers
- Secondary Frequency To Voltage Converter
- Secondary Speed And Acceleration Operational Amplifiers

A capacitance test of the speed sensor cables was performed and found within General Electric's acceptance criteria. With the exception of LIP-EH-04, all above procedures were again performed.

60 Hz noise was found on the primary and backup overspeed trip speed circuits. This noise is from the Eccentricity Detector and has been eliminated by Temporary System Change (TSC) 2-320-91.

This TSC will be closed upon the addition of Proximity Sensors via Modification 1-2-89-002.

The three circuit cards which make up the #1 3 KHz oscillator were replaced and calibrated. Its output circuit was inspected and verified correct.

F. PREVIOUS EVENTS

DVR 1-2-90-070N documents the possible need for realignment of EHC following a bypass valve opening to 50% during testing at 100% power. This corrective action (AIR 374-200-90-07001) has now been completed and was within specifications.

DVR 1-2-91-014 documents the cycling (511 msec) of the five bypass valves, also at 100% power, while no testing was in progress on April 19, 1991. Since Startrec did not record the event, no root cause was determined, but may have been due to Radio Frequency Interference. The corrective action, in addition to AIR 374-200-90-07001, was to trigger Startrec on a bypass valve opening. The addition of this trigger led to the capture of valuable data during this current scram event.

G. COMPONENT FAILURE DATA

None, the Mark I EHC system was supplied by General Electric.

ATTACHMENT 1 TO 9110290249 PAGE 1 OF 1

Commonwealth Edison
LaSalle County Nuclear Station
Rural Route #1, Box 220
Marseilles, Illinois 61341
Telephone 815/357-6761

October 18, 1991

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D.C. 20555

Dear Sir:

Licensee Event Report #91-012-00, Docket #050-374 is being submitted to your office in accordance with 10CFR50.73(a)(2)(iv).

G. J. Diederich
Station Manager
LaSalle County Station

GJD/JJT/mkl

Enclosure

xc: Nuclear Licensing Administrator
NRC Resident Inspector
NRC Region III Administrator
INPO - Records Center
IDNS Resident Inspector

*** END OF DOCUMENT ***
